XC6206 Series

Low ESR Cap.Compatible Positive Voltage Regulators

■GENERAL DESCRIPTION

The XC6206 series are highly precise, low power consumption, 3 terminal, positive voltage regulators manufactured using CMOS and laser trimming technologies. The series provides large currents with a significantly small dropout voltage.
The XC6206 consists of a current limiter circuit, a driver transistor, a precision reference voltage and an error correction circuit. The series is compatible with low ESR ceramic capacitors. The currrent limiter's foldback circuit operates as a short circuit protection as well as the output current limiter for the output pin.
Output voltages are internally by laser trimming technologies. It is selectable in 0.1V increments within a range of 1.2V to 5.0V.
SOT-23, SOT-89, TO-92 and USP-6B packages are available.

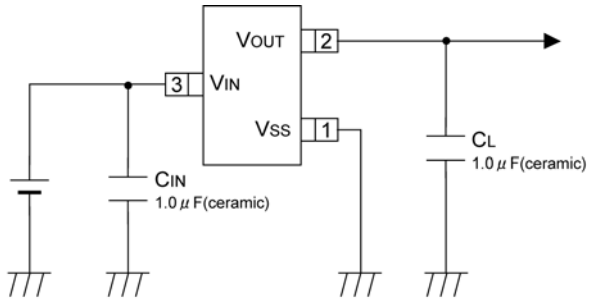
■APPLICATIONS

- Smart phones / Mobile phones
- Portable game consoles
- Digital still cameras / Camcorders
- Digital audio equipments
- Reference voltage sources
- Multi-function power supplies

■FEATURES

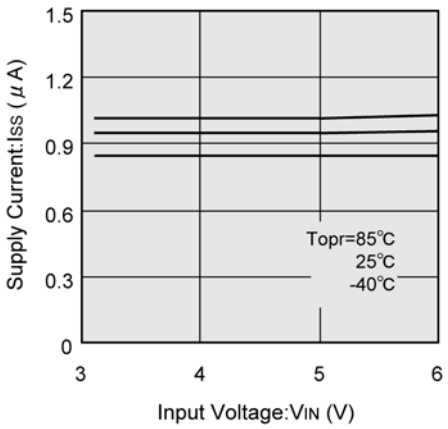
Maximum Output Current	: 200mA (3.0V type)
Dropout Voltage	: 250mV @ 100mA (3.0V type)
Maximum Operating Voltage	: 6.0V
Output Voltage Range	: 1.2V ~ 5.0V (0.1V increments)
Highly Accurate	: ±2%@V_{OUT}≧1.5V ±30mV@V_{OUT}<1.5V (±1% @V_{OUT}≧2.0V)
Low Power Consumption	: 1.0μA (TYP.)
Low ESR Capacitor	: Ceramic capacitor compatible
Protection	: Current Limit Circuit Built-in
Operating Ambient Temperature	: -40℃~ +85℃
Packages	: SOT-23 SOT-89 TO-92 USP-6B
Environmentally Friendly	: EU RoHS Compliant, Pb Free

■TYPICAL APPLICATION CIRCUIT

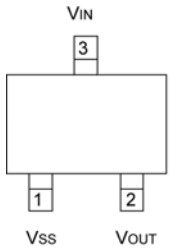


■TYPICAL PERFORMANCE CHARACTERISTICS

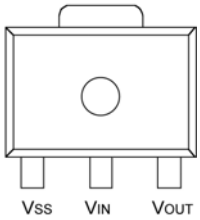
XC6206P302



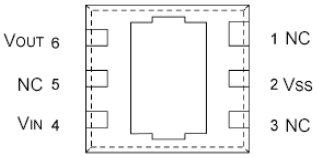
■PIN CONFIGURATION



SOT-23
(TOP VIEW)

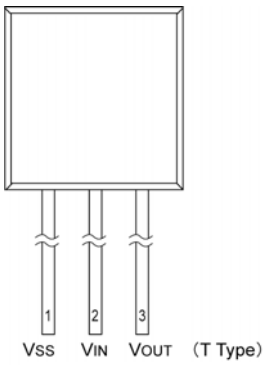


SOT-89
(TOP VIEW)



USP-6B
(BOTTOM VIEW)

*The dissipation pad for the USP-6B package should be solder-plated in recommended mount pattern and metal masking so as to enhance mounting strength and heat release.
If the pad needs to be connected to other pins, it should be connected to the pin number 4 (V_{IN}).



TO-92
(SIDE VIEW)

■PIN ASSIGNMENT

PIN NUMBER				PIN NAME	FUNCTIONS
SOT-23	SOT-89	USP-6B	TO-92		
1	1	2	1	VSS	Ground
3	2	4	2	VIN	Power Input
2	3	6	3	VOUT	Output
-	-	1, 3, 5	-	NC	No Connection

■PRODUCT CLASSIFICATION

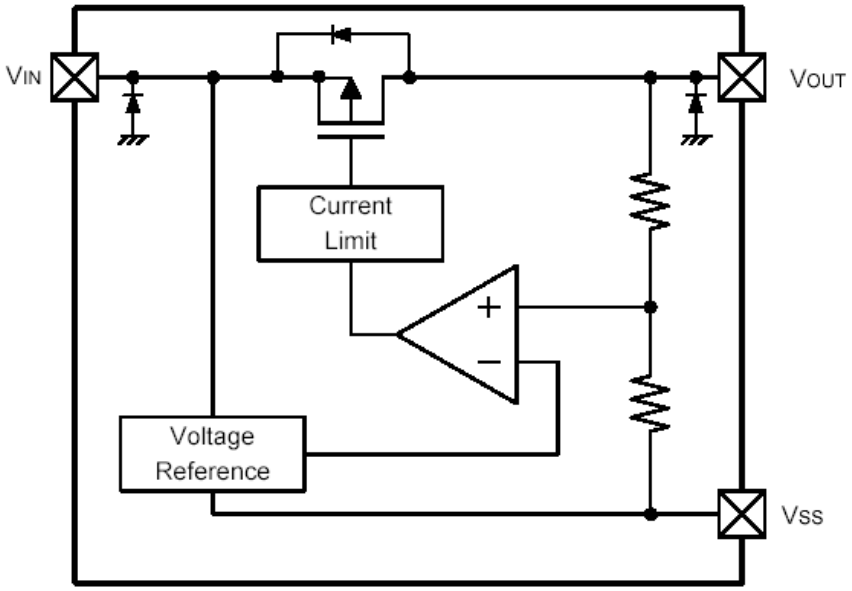
●Ordering Information

XC6206P ①②③④⑤-⑥(*1)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Output Voltage	12~50	e.g. VOUT: 3.0V→①=3, ②=0
③	Accuracy	2	± 2% (V_{OUT}≧1.5V), ±30mV (VOUT<1.5V)
		1	±1% (VOUT≧2.0V)
④⑤-⑥	Packages (Order Unit)	MR	SOT-23 (3,000/Reel)
		MR-G	SOT-23 (3,000/Reel)
		PR	SOT-89 (1,000/Reel)
		PR-G	SOT-89 (1,000/Reel)
		DR	USP-6B (3,000/Reel)
		DR-G	USP-6B (3,000/Reel)
		TH	TO-92 (T type), Paper type (2,000/Tape)
		TH-G	TO-92 (T type), Paper type (2,000/Tape)
		TB	TO-92 (T type), Bag type (500/Bag)
		TB-G	TO-92 (T type), Bag type (500/Bag)

(*1) The “-G” suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

■BLOCK DIAGRAM



*Diodes inside the circuit are an ESD protection diode and a parasitic diode.

■ABSOLUTE MAXIMUM RATINGS

Ta=25°C

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		VIN	7.0	V
Output Current		IOUT	500 *	mA
Output Voltage		VOUT	VSS – 0.3 ~ VIN + 0.3	V
Power Dissipation	SOT-23	Pd	250	mW
	SOT-89		500	
	USP-6B		100	
	TO-92		300	
Operating Ambient Temperature		Topr	- 40 ~ + 85	°C
Storage Temperature		Tstg	- 55 ~ + 125	°C

* IOUT=Pd / (VIN-VOUT)

■ELECTRICAL CHARACTERISTICS

●XC6206P series

Ta=25 °C

PARAMETER	SYMBOL	CONDITIONS(*1)	MIN.	TYP.	MAX.	UNITS	CIRCUIT
Output Voltage (*4)	$V_{OUT(E)}$(*3)	I_{OUT}=30mA	x 0.98	$V_{OUT(T)}$ (*2)	x 1.02	V	①
			E-1				
Maximum Output Current	I_{OUTMAX}	-	E-2	-	-	mA	①
Load Regulation	△V_{OUT}	$V_{OUT(T)}$>1.8V: 1mA≦I_{OUT}≦100mA $V_{OUT(T)}$≦1.8V: 1mA≦I_{OUT}≦50mA	-	-	E-3	mV	①
Dropout Voltage(*5)	Vdif1	I_{OUT}=30mA	-	E-4		mV	①
	Vdif2	$V_{OUT(T)}$>1.8V: I_{OUT}=100mA $V_{OUT(T)}$≦1.8V: I_{OUT}=60mA	-	E-5		mV	
Supply Current	I_{DD}	V_{CE}=V_{IN}	-	1.0	3.0	μA	②
Line Regulation	△V_{OUT} / △V_{IN}・V_{OUT}	$V_{OUT(T)}$<4.5V:$V_{OUT(T)}$+1.0V≦V_{IN}≦6.0V $V_{OUT(T)}$≧4.5V:5.5V≦V_{IN}≦6.0V I_{OUT}=30mA	-	0.05	0.25	%/V	①
Input Voltage	V_{IN}	-	1.8	-	6.0	V	-
Output Voltage Temperature Characteristics	△V_{OUT} / △Topr・V_{OUT}	I_{OUT}=30mA -40 °C≦Topr≦85 °C	-	±100	-	ppm/ °C	①
Short Circuit Current	Ishort	V_{IN}=V_{OUT}+1.5V, V_{OUT}=V_{SS}	-	E-6	-	mA	①

NOTE:

* 1 Unless otherwise stated, V_{IN} = $V_{OUT(T)}$ + 1.0V
* 2 $V_{OUT(T)}$:Nominal voltage
* 3 $V_{OUT(E)}$:Effective output voltage (Ie. The output voltage when "$V_{OUT(T)}$+1.0V" is provided at the V_{IN} pin while maintaining a certain I_{OUT} value.)
* 4 For output voltage accuracy, Please refer to E-1 table.
* 5 Vdif =V_{IN1} -V_{OUT1}

  V_{OUT1} :A voltage equal to 98% of the output voltage whenever an amply stabilized {$V_{OUT(T)}$ + 1.0V} is input with each I_{OUT}.

  V_{IN1} :The input voltage when V_{OUT1} appears as input voltage is gradually decreased.

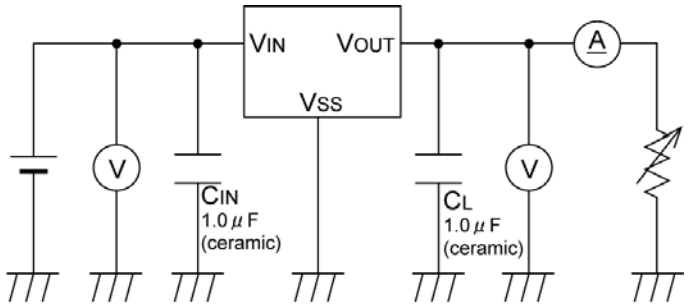
■ELECTRICAL CHARACTERISTICS (Continued)

●Electrical Characteristics Chart

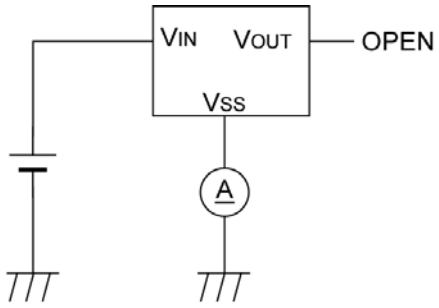
	E-1				E-2	E-3	E-4		E-5		E-6
PARAMETER / NOMINAL VOLTAGE	OUTPUT VOLTAGE				MAX. OUTPUT CURRENT	LOAD REGULATION	DROPOUT VOLTAGE 1		DROPOUT VOLTAGE 2		SHORT CURRENT
	2% ACCURACY		1% ACCURACY								
$V_{OUT(T)}$	$V_{OUT(E)}$ (V)		$V_{OUT(E)}$ (V)		I_{OUTMAX} (mA)	$\triangle V_{OUT}$ (mV)	Vdif1 (mV)		Vdif2 (mV)		Ishort (mA)
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.	TYP.
1.2	1.170	1.230	Not Available		60	40	460	760	700	960	180
1.3	1.270	1.330					400	650			
1.4	1.370	1.430					350	590	580	860	
1.5	1.470	1.530				45	300	510			155
1.6	1.568	1.632			80		250	450	450	810	
1.7	1.666	1.734					200	410			
1.8	1.764	1.836					150	390	350	780	130
1.9	1.862	1.938					100	370			
2.0	1.960	2.040	1.980	2.020	120	50				710	
2.1	2.058	2.042	2.079	2.121							
2.2	2.156	2.244	2.178	2.222							
2.3	2.254	2.346	2.277	2.323							100
2.4	2.352	2.448	2.376	2.424							
2.5	2.450	2.550	2.475	2.525	150	55					
2.6	2.548	2.652	2.574	2.626							
2.7	2.646	2.754	2.673	2.727							
2.8	2.744	2.856	2.772	2.828							
2.9	2.842	2.958	2.871	2.929							
3.0	2.940	3.060	2.970	3.030	200	60	75	350	250	680	
3.1	3.038	3.162	3.069	3.131							
3.2	3.136	3.264	3.168	3.232							
3.3	3.234	3.366	3.267	3.333							
3.4	3.332	3.468	3.366	3.434							
3.5	3.430	3.570	3.465	3.535		65					
3.6	3.528	3.672	3.564	3.636							
3.7	3.626	3.774	3.663	3.737							
3.8	3.724	3.876	3.762	3.838							
3.9	3.822	3.978	3.861	3.939							
4.0	3.920	4.080	3.960	4.040	250	70	60	320	200	630	
4.1	4.018	4.182	4.059	4.141							
4.2	4.116	4.284	4.158	4.242							
4.3	4.214	4.386	4.257	4.343							
4.4	4.312	4.488	4.356	4.444							
4.5	4.410	4.590	4.455	4.545		75					
4.6	4.508	4.692	4.554	4.646							
4.7	4.606	4.794	4.653	4.747							
4.8	4.704	4.896	4.752	4.848							
4.9	4.802	4.998	4.851	4.949							
5.0	4.900	5.100	4.950	5.050		80	50	290	175	600	

■TEST CIRCUITS

Circuit ①

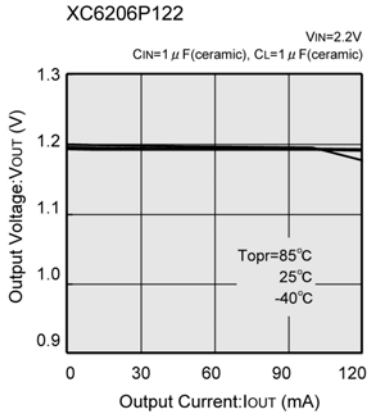


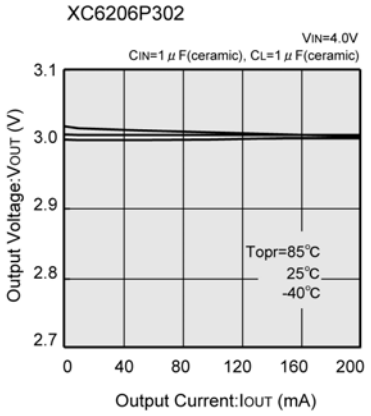
Circuit ②

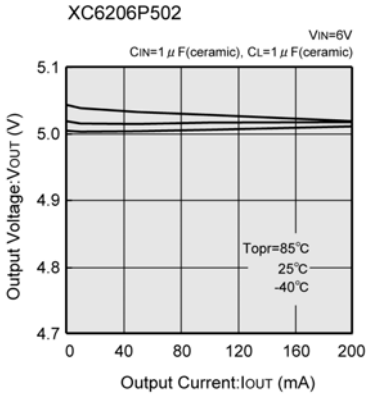


■TYPICAL PERFORMANCE CHARACTERISTICS

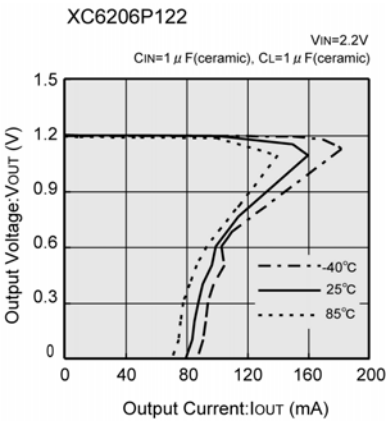
(1) Output Voltage vs. Output Current

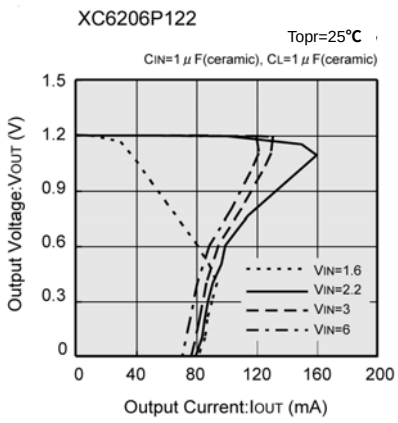


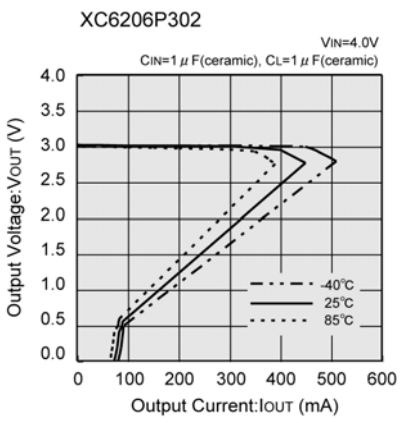


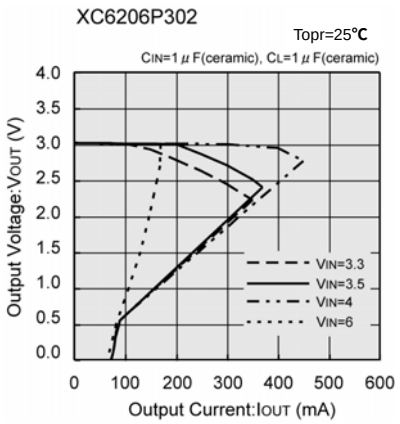


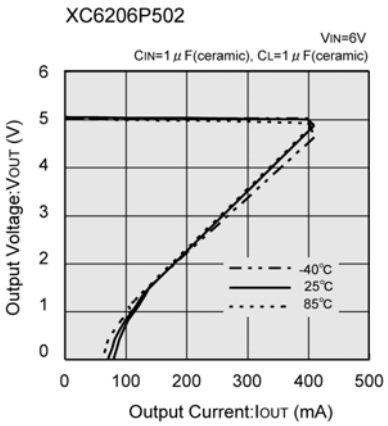
(2) Current Limit

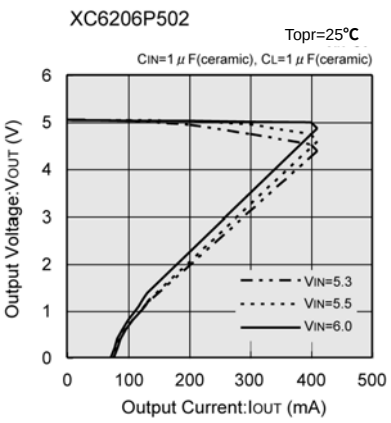






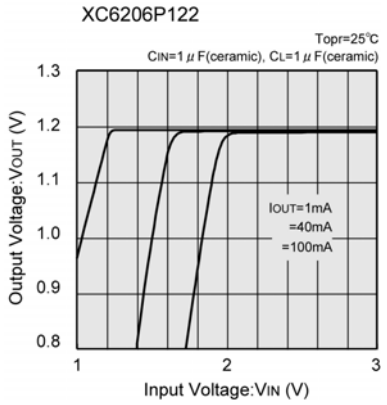


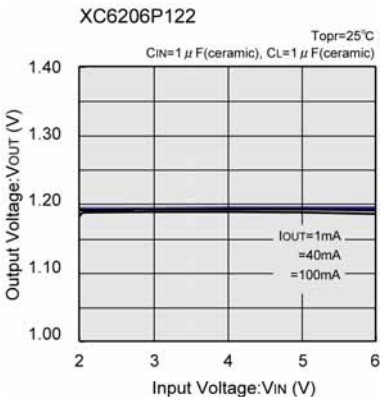


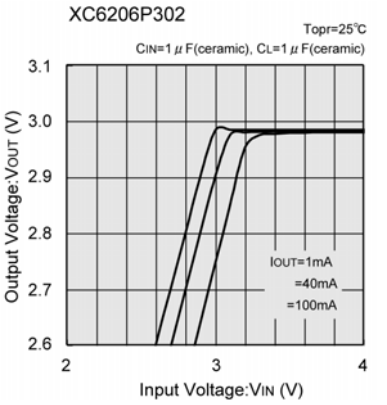


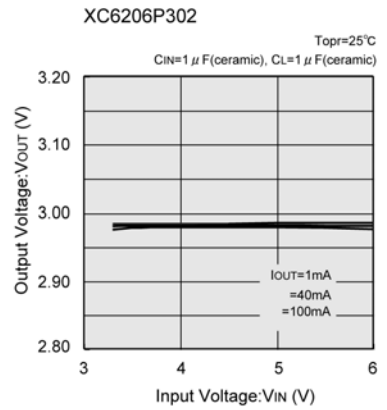
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

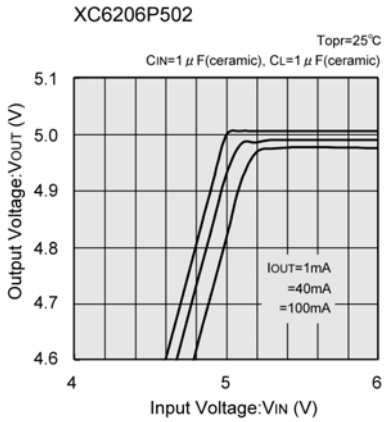
(3) Output Voltage vs. Input Voltage

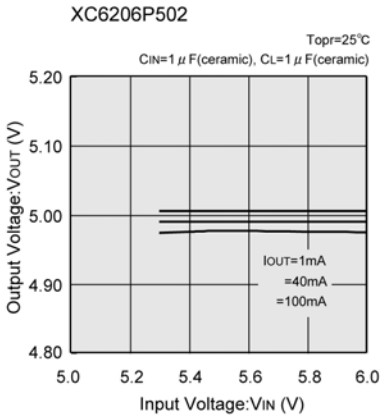




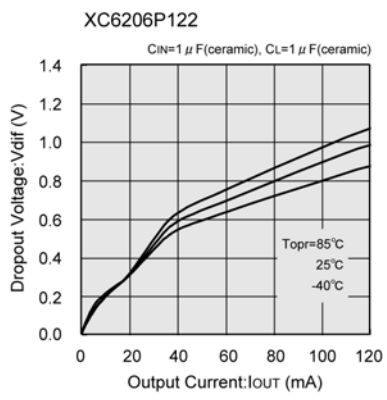


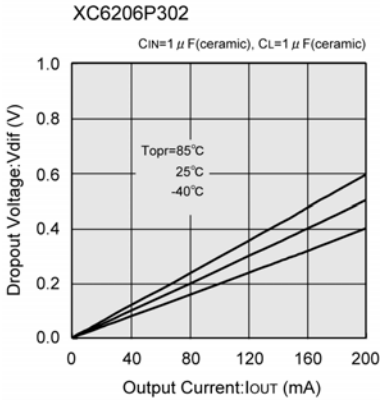


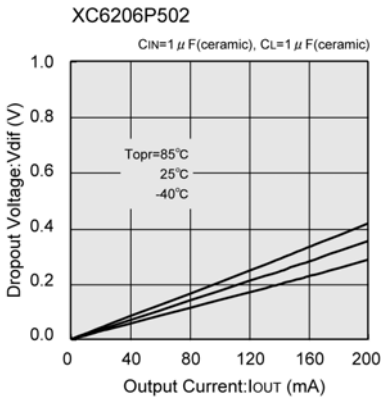




(4) Dropout Voltage vs. Output Current







■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(5) Supply Current vs. Input Voltage

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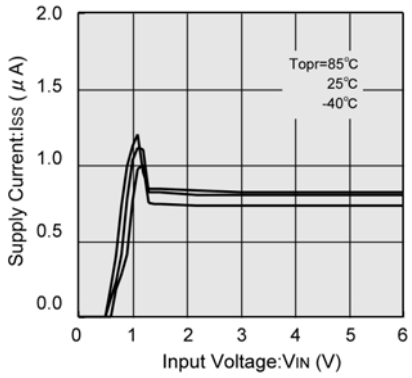

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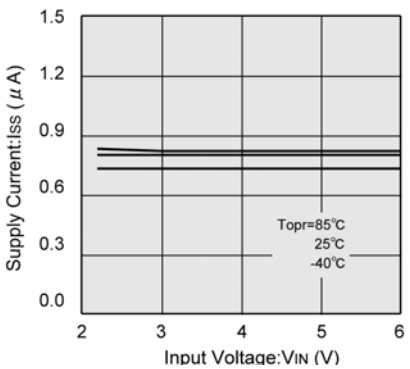

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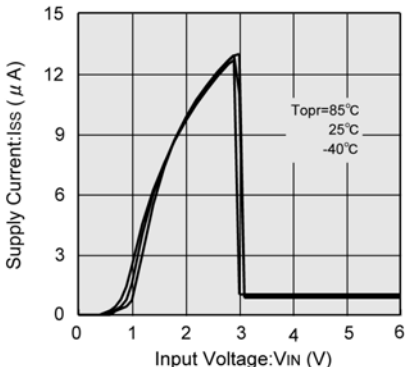

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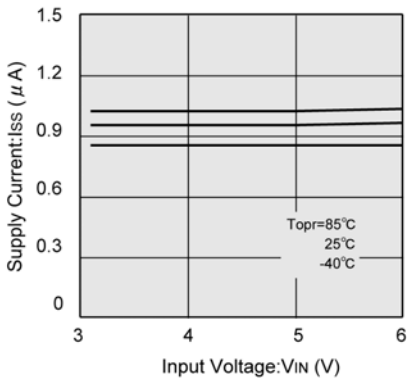
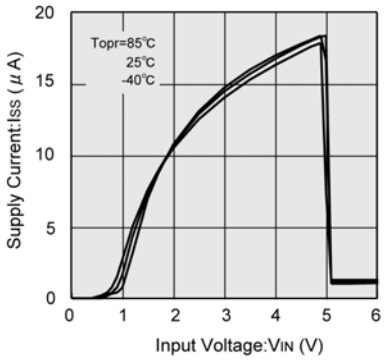


XC6206P502



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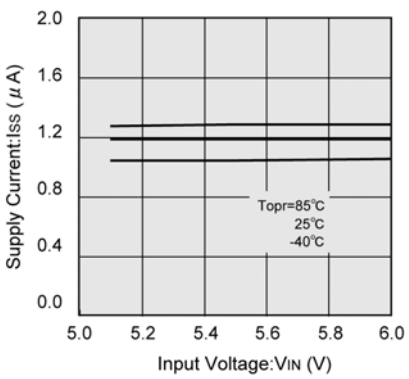
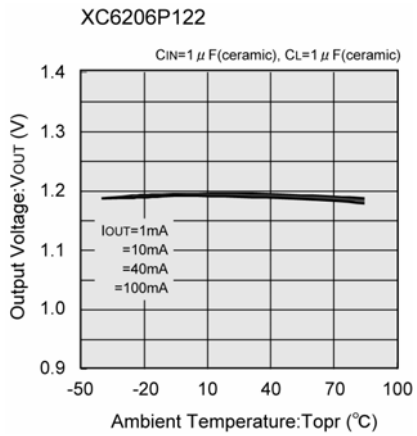


(6) Output Voltage vs. Ambient Temperature

XC6206P122



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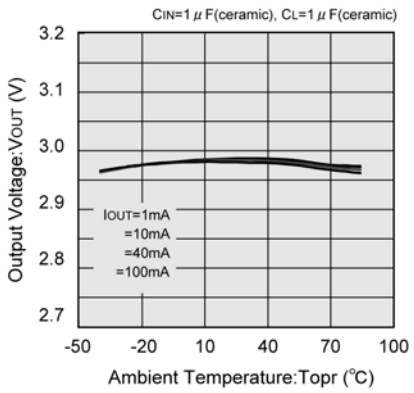
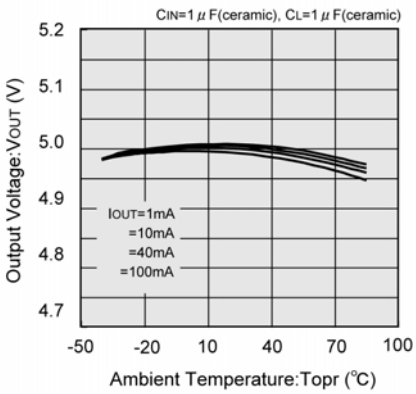
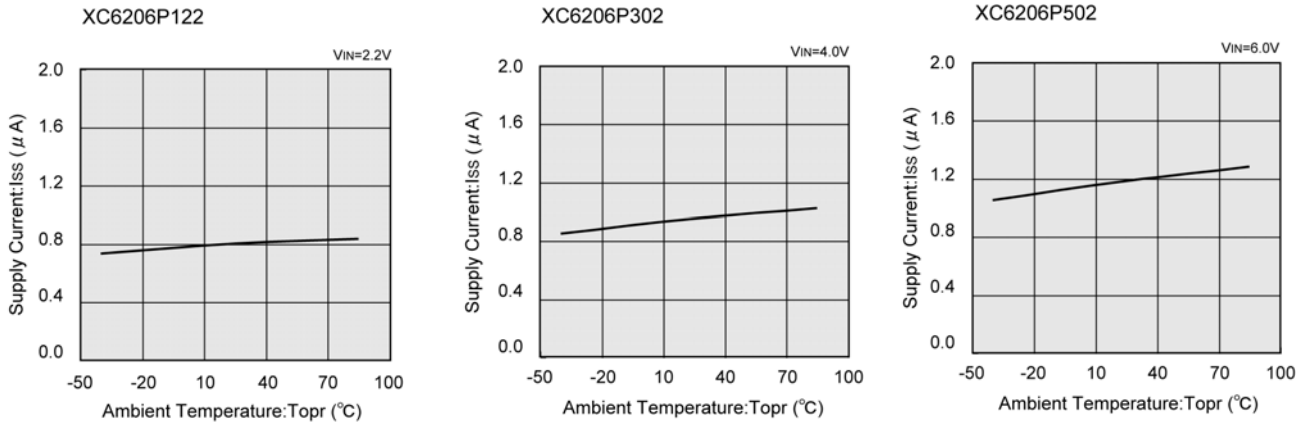


XC6206P502

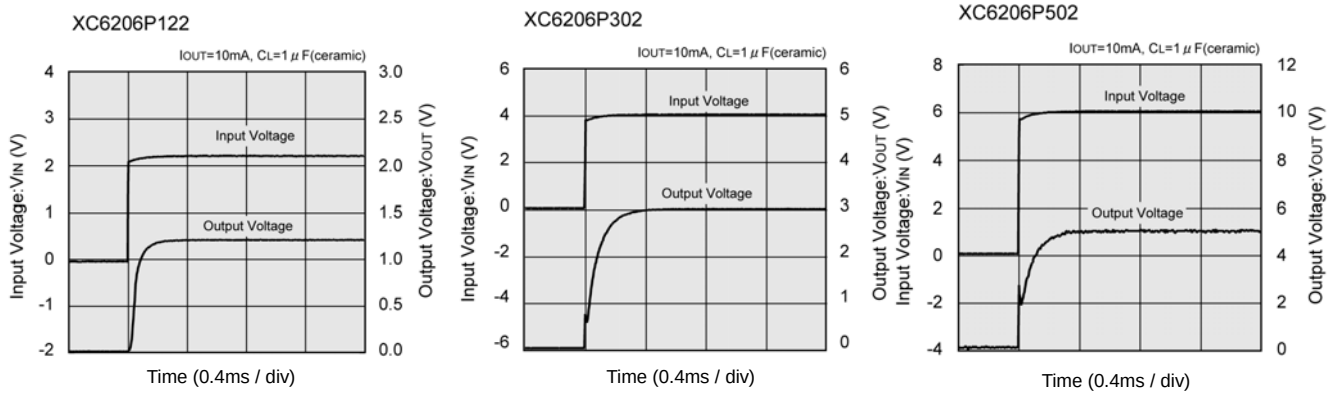


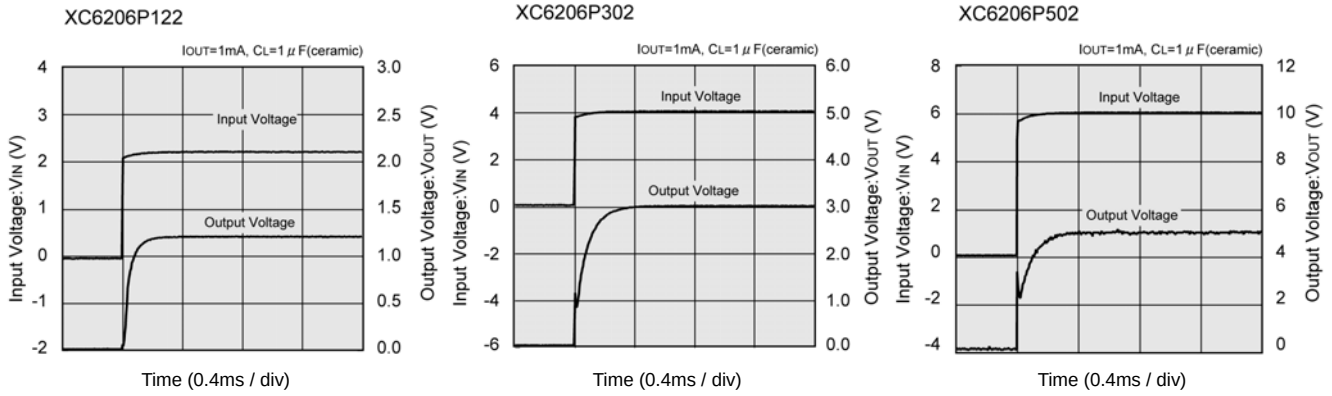
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(7) Output Voltage vs. Ambient Temperature



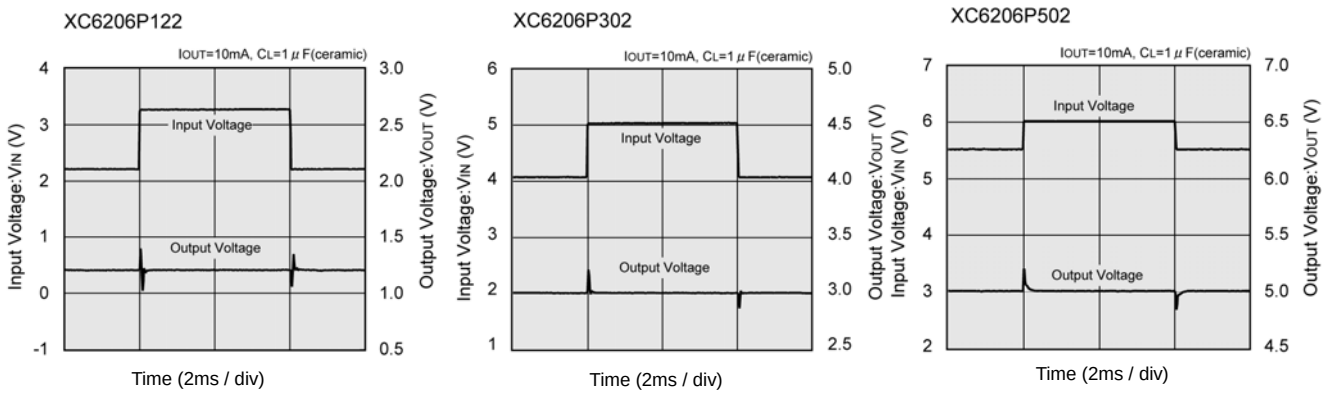
(8) Input Transient Response 1

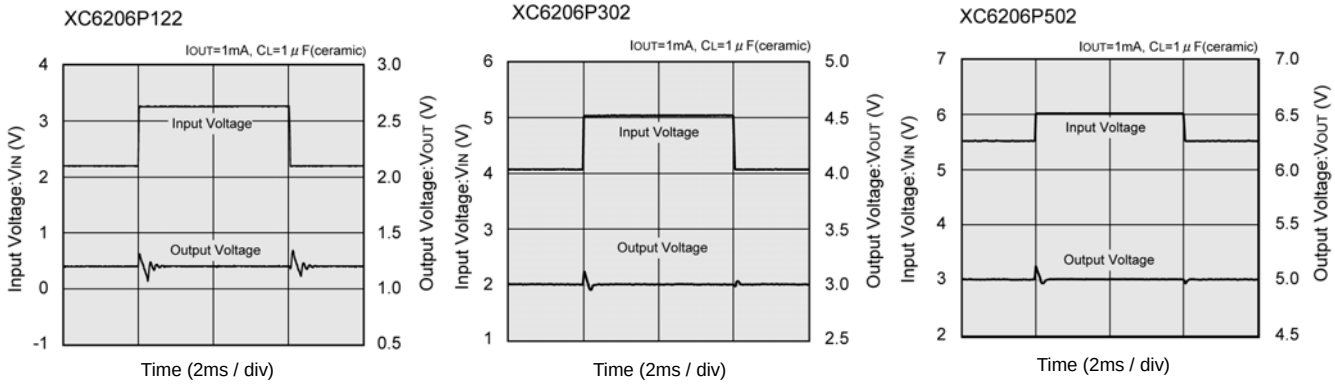




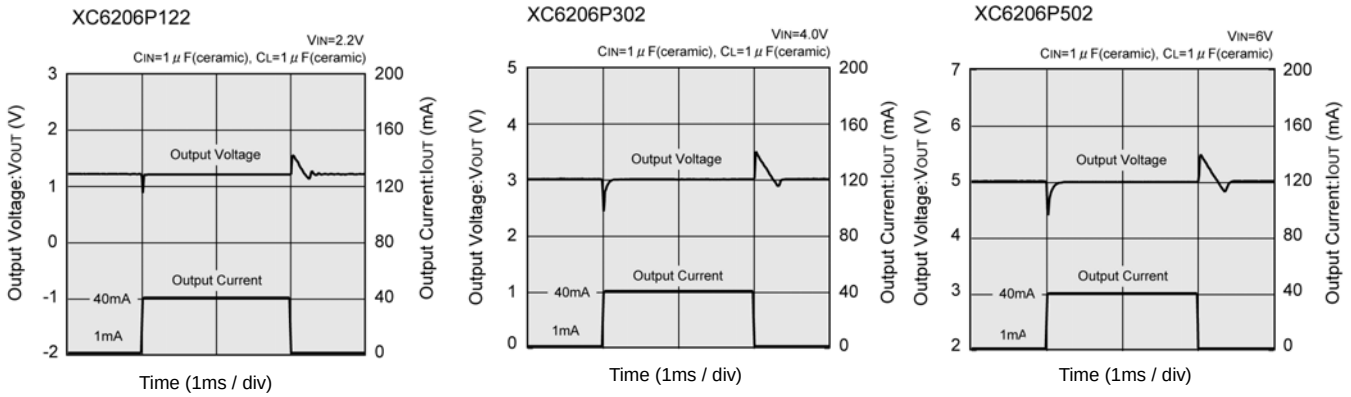
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(9) Input Transient Response 2



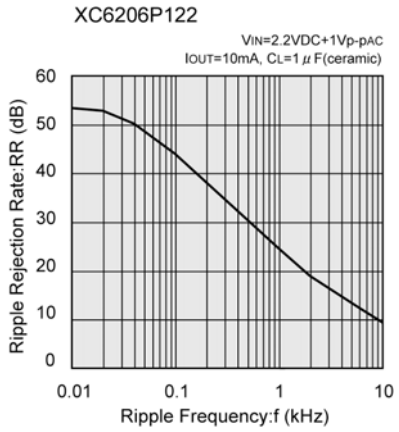


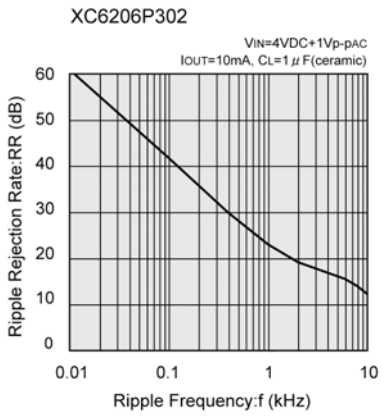
(10) Load Transient Response

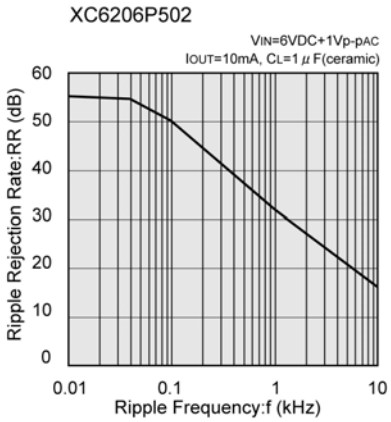


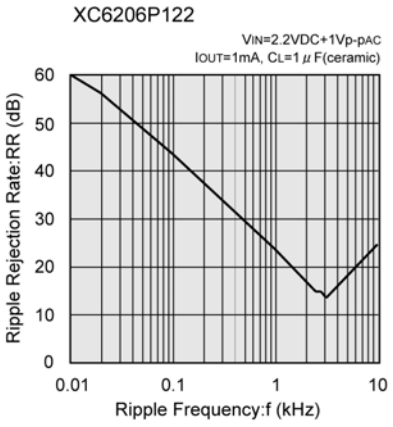
■TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

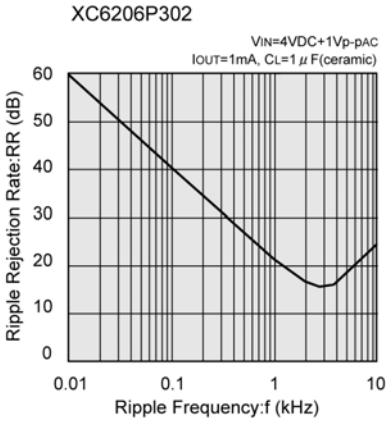
(11) Ripple Rejection Rate

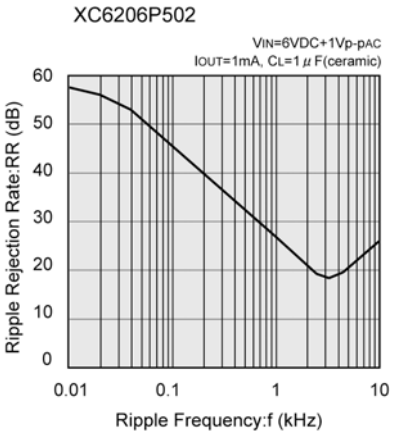








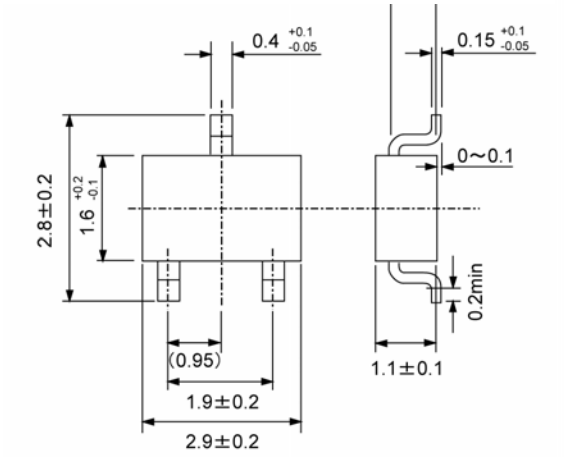




■PACKAGING INFORMATION

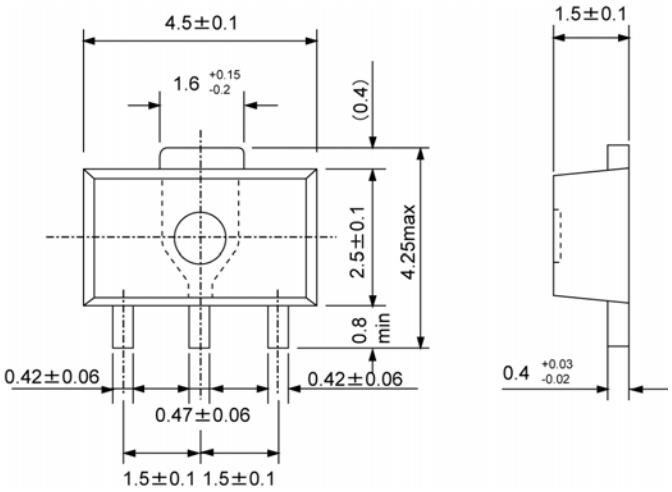
●SOT-23

Unit : mm



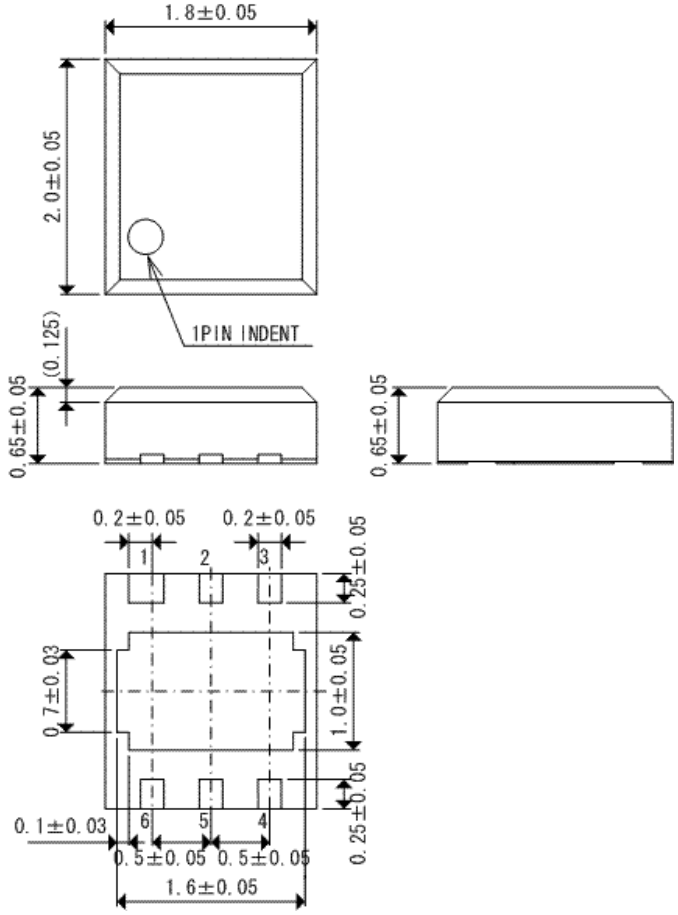
●SOT-89

Unit : mm



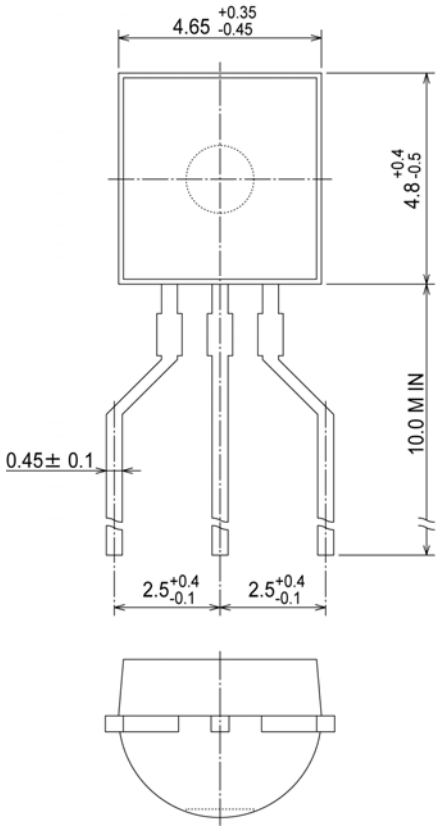
●USP-6B

Unit : mm



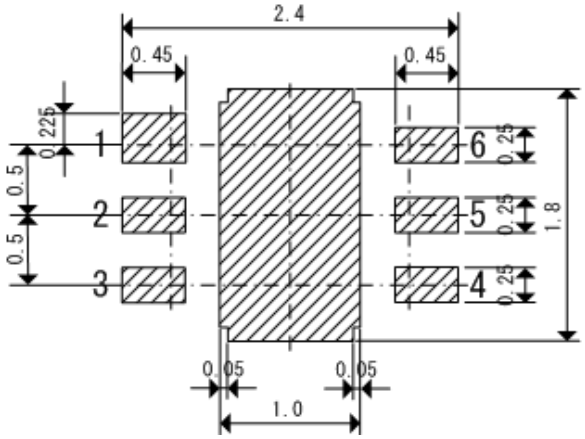
●TO-92

Unit : mm

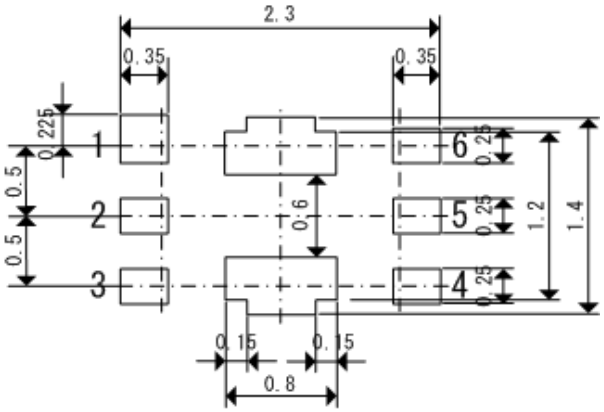


■PACKAGING INFORMATION (Continued)

●USP-6B Reference Pattern Layout

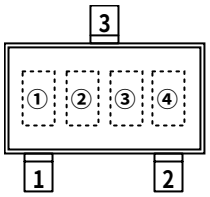


●USP-6B Reference Metal Mask Design

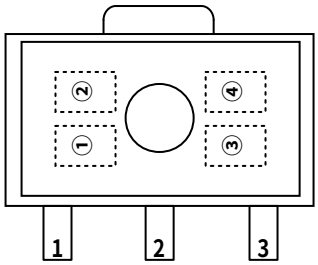


■MARKING RULE

●SOT-23, SOT-89



SOT-23
(TOP VIEW)



SOT-89
(TOP VIEW)

① represents product number

MARK	PRODUCT SERIES
6	XC6206P*****

② represents 3 pins regulator

MARK		PRODUCT SERIES
VOLTAGE＝0.1 ~ 3.0V	VOLTAGE＝3.1 ~ 6.0V	
5	6	XC6206P*****

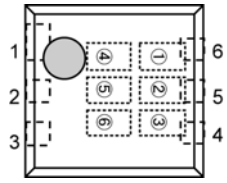
③ represents output voltage

MARK	VOLTAGE (V)			MARK	OUTPUT VOLTAGE (V)		
0	-	3.1	-	F	1.6	4.6	-
1	-	3.2	-	H	1.7	4.7	-
2	-	3.3	-	K	1.8	4.8	-
3	-	3.4	-	L	1.9	4.9	-
4	-	3.5	-	M	2.0	5.0	-
5	-	3.6	-	N	2.1	-	-
6	-	3.7	-	P	2.2	-	-
7	-	3.8	-	R	2.3	-	-
8	-	3.9	-	S	2.4	-	-
9	-	4.0	-	T	2.5	-	-
A		4.1	-	U	2.6	-	-
B	1.2	4.2	-	V	2.7	-	-
C	1.3	4.3	-	X	2.8	-	-
D	1.4	4.4	-	Y	2.9	-	-
E	1.5	4.5	-	Z	3.0	-	-

④ represents production lot number
0 to 9, A to Z, and inverted 0 to 9, A to Z repeated. (G, I, J, O, Q, W excepted.)

■MARKING RULE (Continued)

●USP-6B



USP-6B
(TOP VIEW)

①② represents product number

MARK		PRODUCT SERIES
①	②	
0	6	XC6206P***D*

③ represents 3 pins regulator

MARK	PRODUCT SERIES
P	XC6206P***D*

④⑤ represents output voltage

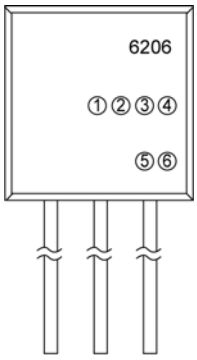
MARK		OUTPUT VOLTAGE(V)	PRODUCT SERIES
④	⑤		
3	3	3.3	XC6206P33*D*
5	0	5.0	XC6206P50*D*

⑥ represents production lot number

0 to 9, A to Z repeated. (G, I, J, O, Q, W excluded)

*No character inversion used.

● TO-92



TO-92 (T Type)
(SIDE VIEW)

① represents type of regulator

MARK	PRODUCT SERIES
P	XC6206P*****

②③ represents output voltage

MARK		VOLTAGE (V)	PRODUCT SERIES
②	③		
3	3	3.3	XC6206P33***
5	0	5	XC6206P50***

④ represents output voltage accuracy

MARK	OUTPUT VOLTAGE ACCURACY	PRODUCT SERIES
1	±1%	XC6206P**1**
2	±2%	XC6206P**2**

⑤ represents least significant digit of the production year

MARK	PRODUCTION YEAR
3	2003
4	2004

⑥ represents production lot number

0 to 9, A to Z repeated. (G, I, J, O, Q, W excluded)

*No character inversion used.

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   (e.g. Atomic energy; aerospace; transport; combustion and associated safety equipment thereof.)
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